

CLAIMS

1. In a system of devices, a policy-driven method for querying, the method comprising:
accepting a query, from a client, directed to a device;
5 selecting a query policy; and,
sending the query to an agent using a method responsive to the selected query policy.

2. The method of claim 1 further comprising:
10 receiving a query result from the agent; and,
sending the query result to the client using a method responsive to the selected query policy.

3. The method of claim 2 further comprising:
15 merging a plurality of query results in response to the selected query policy; and,
wherein sending the query result to the client includes sending the merged query result to the client.

20 4. The method of claim 3 wherein selecting a query policy includes selecting a multi-mode query policy;
wherein sending the query to the agent includes sending a query to a plurality of agents;
wherein receiving a query result from the agent includes
25 receiving a plurality of query results from the corresponding plurality of agents; and,

wherein merging a plurality of query results includes
merging the plurality of query results from the plurality of agents.

5. The method of claim 2 wherein selecting a query policy
5 includes using a selection criteria from the group including pre-
configured, manual, and automatic selection criteria.

6. The method of claim 5 wherein using an automatic
selection criteria includes using an automatic selection criteria from the
10 group including static, heuristic, and adaptive criteria.

7. The method of claim 4 wherein selecting a query policy
includes selecting a global query policy that is independent of the
information requested in the query.

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8. The method of claim 4 wherein selecting a query policy
includes selecting an information-type query policy; and,
wherein sending the query to the plurality of agents using a
method responsive to the selected query policy includes, for each agent,
20 using a method corresponding to the information requested in the query.

9. The method of claim 4 wherein selecting a query policy
includes selecting an element-type query policy; and,
the method further comprises:
25 identifying each type of agent associated with a directed
query; and,

wherein sending the query to the plurality of agents using a method responsive to the selected query policy includes, for each agent, using the method corresponding to the identified agent type.

5 10. The method of claim 4 wherein selecting a query policy includes selecting a policy from the group including response time and reliability policies.

10 11. The method of claim 10 wherein selecting a query policy includes selecting a response time policy; and,
 the method comprising:
 ranking the probable time associated with each agent query result; and,
 wherein sending the query to the plurality of agents includes
15 sending the queries in a hierarchical order responsive to the probable result times.

 12. The method of claim 10 wherein selecting a query policy includes selecting a reliability policy; and,
20 the method comprising:
 ranking the probable reliability associated with each agent query result; and,
 wherein sending the query to the plurality of agents includes
 sending the queries in a hierarchical order responsive to probable
25 reliability.

13. The method of claim 3 wherein selecting a query policy includes selecting an accuracy policy; and,

the method comprising:

ranking the probable accuracy associated with each agent

5 query method;

wherein sending the query to an agent includes sending a query to an agent using a plurality of methods;

wherein receiving a query results from the agent includes receiving a plurality of results corresponding to the plurality of query

10 methods; and,

wherein merging a plurality of query results includes selecting the results most likely to be accurate.

14. The method of claim 1 wherein accepting a query, from
15 a client, directed to a device includes accepting a query directed to information concerning device communication port information, network information, communication checks (Ping), capability requests, and status updates; and,

wherein sending the query result to the client using a
20 method responsive to the selected query policy includes sending a query result directed to information concerning device communication port information, network information, communication checks (Ping), capability requests, and status updates.

25 15. The method of claim 1 wherein sending the query to the agent using a method responsive to the selected query policy includes

using a method selected from the group including spooler application programming interface (API), simple network management protocol (SNMP), printer database, proprietary protocol, Windows 2K directory service, service location protocol (SLP), print job language (PJL)

5 USTATUS, BMLinkS queries, queries concerning an embedded device web page using hypertext transport protocol (HTTP), and other industry standard methods.

16. The method of claim 3 wherein merging a plurality of
10 query results includes merging query results using a process selected from the group including filtering query results, grouping a plurality of results into a single result, and weighing the plurality of results.

17. The method of claim 1 further comprising:
15 caching device information; and,
wherein receiving a query result from the agent includes receiving cached device information as the query result.

18. The method of claim 1 wherein accepting a query, from
20 a client, directed to a device includes accepting a query from a client selected from the group including local, remote, network-connected clients.

19. The method of 1 wherein sending the query to a agent
25 using a method responsive to the selected query policy includes sending a

query to an agent having a connectivity with the device selected from the group including local, remote, and network connectivity.

20. The method of claim 1 wherein accepting a query, from
5 a client, directed to a device includes accepting a query directed to an imaging device selected from the group including a printer, fax, scanner, multifunctional peripheral (MFP), and copier devices.

21. The method of claim 1 wherein sending the query to
10 an agent using a method responsive to the selected query policy includes sending the query to an agent selected from the group including the device that is the subject of the query and a microprocessor-driver computer including a service in communication with the device.

15 22. The method of claim 2 wherein accepting a query, from a client, directed to a device includes accepting a query directed to a first device;

wherein sending the query to a agent using a method responsive to the selected query policy includes sending the query to a
20 agent cache including first device permanent information; and,

wherein receiving a query result from the agent includes receiving first device permanent information query results from the agent cache.

25 23. The method of claim 22 further comprising:
caching device information in the agent cache; and,

wherein receiving a query result from the agent includes receiving query results from the agent cache selected from the group including permanent and cached device information.

5 24. The method of claim 23 wherein caching device information in the agent cache includes caching semi-permanent information that does not change between power up cycles and non-permanent data that changes between power up cycles.

10 25. A policy-driven system for querying devices, the system comprising:
 a client having an interface to supply a query directed to a device;
 a manager having an interface connected to receive the query
15 from the client and an interface to send queries, the manager selecting a query policy and sending the query using a method responsive to the selected query policy.

 26. The system of claim 25 further comprising:
20 an agent having an interface to receive queries from the manager and to send query results to the manager; and,
 wherein the manager sends query results, received from the agent, to the client using a method responsive to the selected query policy.

25 27. The system of claim 26 wherein the agent has an interface for relaying queries; and,

the method further comprising:

a device having an interface to receive queries relayed from the agent and to supply query results to the agent.

5 28. The system of claim 26 wherein the manager merges a plurality of query results in response to the selected query policy and sends the merged query result to the client.

 29. The system of claim 28 wherein the manager selects a
10 multi-mode query policy, sends a query to a plurality of agents, receives a plurality of query results from the corresponding plurality of agents, and merges the plurality of query results.

 30. The system of claim 26 wherein the manager selects a
15 policy in response to criteria from the group including pre-configured, manual, and automatic selection criteria.

 31. The system of claim 30 wherein the manager uses an automatic policy selection criteria from the group including static,
20 heuristic, and adaptive policies.

 32. The system of claim 26 wherein the manager selects a global query policy that is independent of the information requested in the query.

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33. The system of claim 26 wherein the manager selects an information-type query policy and sends queries corresponding to the information requested in the query.

5 34. The system of claim 26 wherein the manager selects an element-type query policy, identifies each type of agent associated with a directed query, and sends queries using a method corresponding to the identified agent type.

10 35. The system of claim 26 wherein the manager selects a response time policy, ranks the probable time associated with each agent query result, and sends the queries in a hierarchical order responsive to the probable result times.

15 36. The system of claim 26 wherein the manager selects a reliability policy, ranks the probable reliability associated with each agent query result, and sends the queries in a hierarchical order responsive to probable reliability.

20 37. The system of claim 28 wherein the manager selects an accuracy policy, ranks the probable accuracy associated with each agent query method, sends a query to a agent using a plurality of methods, receives a plurality of results corresponding to the plurality of query methods, and merges the plurality of query results by selecting the
25 results most likely to be accurate.

38. The system of claim 26 wherein the manager accepts a query from the client directed to information concerning device communication port information, network information, communication checks (Ping), capability requests, and status updates, and sends a query
5 result to the client directed to information concerning device communication port information, network information, communication checks (Ping), capability requests, and status updates.

39. The system of claim 26 wherein the manager sends a
10 query to the agent using a method selected from the group including spooler API, simple network management protocol (SNMP), printer database, proprietary protocol, Windows 2K directory service, service location protocol (SLP), PJI USTATUS, BMLinkS queries, queries concerning an embedded device web page using hypertext transport
15 protocol (HTTP), and other industry standards.

40. The method of claim 28 wherein the manager merges query results using a process selected from the group including filtering query results, grouping a plurality of results into a single result, and
20 weighing the plurality of results.

41. The system of claim 26 wherein the agent includes a cache for storing device information;; and,
wherein the manager receives a cached query result from the
25 agent in response to the selected query policy.

42. The system of claim 26 wherein the client is a device that has a relationship with the manager selected from the group including local, remote, network connectivity.

5 43. The system of 27 wherein the device is a device that has a relationship with the manager selected from the group including local, remote, and network connectivity.

44. The system of claim 27 wherein the device is a device
10 selected from the group including a printer, fax, scanner, multifunctional peripheral (MFP), and copier devices.

45. The system of claim 27 wherein the agent is a device
selected from the group including the device that is the subject of the
15 query and a microprocessor-driver computer including a service in communication with the device.

46. The system of claim 26 wherein the agent includes a
cache with first device permanent information and semi-permanent
20 information, that does not change between power up cycles, the agent returning a query result from the cache in response to a query concerning the first device.

47. The system of claim 46 wherein the agent cache
25 includes non-permanent first device information that changes between power up cycles, the agent returning a query result with device

information selected from the group including permanent, semi-permanent, and non-permanent information.